RADIO POLARIMETRY IN THE SOUTHERN GALACTIC PLANE SURVEY

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We present radio polarimetric observations of a region spanning $325.5^\circ < l < 332.5^\circ$, $-0.5^\circ < b < 3.5^\circ$, used as a test region for the Southern Galactic Plane Survey (SGPS) [1]. The SGPS is a radio survey in the Southern Galactic plane in HI and polarized continuum at 9 frequencies around 1.4 GHz, performed with the Australia Telescope Compact Array (ATCA) and the Parkes 64m dish [2]. Ubiquitous structure in linearly polarized intensity is often uncorrelated with structure in total intensity, indicating Faraday rotation and depolarization.

The second order structure function (SF) of RM $SF_{RM}(\mathbf{r}) = \langle (RM(\mathbf{x}) - RM(\mathbf{x}+\mathbf{r}))^2 \rangle_{\mathbf{x}}$ (where $\langle\rangle_{\mathbf{x}}$ denotes averaging over all positions $\mathbf{x}$ in the field) for different position angles α of the vector $\mathbf{r}$ shows a very shallow slope of the SF ($\sim$0.2) on small scales and an anisotropy in the slope on large scales.The anisotropy on large scale scales is indicative of a gradient or large filament across the field.

The shallow slope can be explained by contributions of two separated Faraday screens. Then, the saturation scale of the SF denotes the outer scale of structure in the nearest Faraday screen. Assuming that the two Faraday screens are the local and Carina spiral arms, at distances of $\sim$100 pc and $\sim$1500 pc, respectively, the saturation point of the SF at log(r) = -0.2 denotes the outer scale of structure in the local arm, i.e. about 2 pc. This scale is similar to the typical scale of a Strømgren sphere of a B1-2 star. Therefore, we suggest that H II regions possibly dominate the scale of structure in spiral arms.

References

[1] Gaensler, B. M., Dickey, J. M., McClure-Griffiths, N. M., Green, A. J., Wieringa, M. H., & Haynes, R. F. 2001, ApJ, 549, 959

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